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'Consider Obstructive Sleep Apnea in Patients with Oropharyngeal Vascular Malformations'

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Title page

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Running title: Obstructive Sleep Apnea in Vascular Malformations

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Consider Obstructive Sleep Apnea in Patients with Oropharyngeal Vascular Malformations

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Abstract

Introduction:

Patients with oropharyngeal vascular malformations with complaints of upper airway obstruction were referred to a sleep specialist to investigate the existence of obstructive sleep apnea (OSA).

Methods:

Demography, complaints, localization, and extent of the malformation were noted. The Epworth Sleeping Scale (ESS) and a polysomnography were performed to analyse the existence of OSA.

Results:

Thirteen patients with vascular malformations in the upper oropharyngeal tract were referred, with a mean age of 49 years (range, 20–77 years). The male: female ratio was 7:6. In 2 patients the ESS was missed, and in the other 11 patients the mean ESS was 11.7 (range, 4–23). After polysomnography, 11 of the 13 patients (85%) were diagnosed with OSA, of whom 7 patients had severe OSA.

Conclusion:

Patients with oropharyngeal vascular malformations with complaints of upper airway obstruction have a high risk of OSA, and should be referred to a sleep specialist.

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Introduction:

Vascular anomalies of the head and neck can be classified as either hemangiomas or vascular malformations (Mulliken and Glowacki 1982).

Hemangiomas are relative common in young children. They are characterized by a proliferative phase in the first year of life, then stabilise and slowly involute, so conservative wait-and-see treatment is favoured (McHeik et al. 2005). Endangering hemangiomas leading to airway obstruction can be treated with propranolol in early childhood (Richter and Friedman 2012).

Vascular malformations are normally present at birth and grow commensurately with body growth, and do not resolve spontaneously (Watzinger et al. 1997). Complaints are pain due to local swelling and or thromboembolic events. Depending on the extent of the malformation, complaints may start early in life; however under the influence of hormones, they may start in adulthood and worsen in time.

Venous malformations (VM) in the head and neck area leading to upper airway obstruction are described in the literature in children (Jacobs and Cahill 2011) and adults (Nouraei and Sandhu 2013). VM are low-flow anomalies of ecstatic venous vessels. Multiple genetic factors are associated with VM, and TIE2 mutations are the best understood abnormality (Uebelhoer et al. 2013). However the etiology remains an area of speculation and research. Histological examination shows convoluted vascular vessels of variable size and thickness. A relative lack of smooth muscle cells is seen (Vikkula et al. 2001).

The diagnosis of VM is based on patient history, physical examination, and additional imaging, preferably by magnetic resonance imaging (MRI). On MRI, the anatomical extent of the malformation is demonstrated and flow characteristics are shown.

For VM in the head and neck multiple treatment options exist. Conservative treatment includes conservative measures as a semi recumbent sleeping position to decrease hydrostatic pressure. Pain and thrombosis may be treated with nonsteroidal anti-inflammatory drugs (NSAIDs) and anticoagulation therapy (Buckmiller et al. 2010). Laser therapy, sclerotherapy, and surgery have proved to be effective (Nouraei and Sandhu 2013; Ohlms et al. 1996; Judith et al. 2014).

Lymphatic malformations (LM) are congenital collections of ecstatic lymph vessels (Mulliken and Glowacki 1982). Pathogenesis and development of LM are not fully understood (Blei 2008). They can present in a wide variety in the head and neck. The lesion will typically grow commensurate with the child, but may rapidly swell with (upper airway) infection. The lesion is not influenced by postural changes. Patients can present with deformity, pain, airway obstruction, speech difficulty, and an infection of the malformation itself.

Arteriovenous malformations (AVM) are formed by abnormal connections between arteries and veins, bypassing the capillary system. They are often crooked, dilated, and show a thick

vessel wall. The treatment consists of embolization or surgical extirpation, with a high recurrence rate (Richter and Friedman 2012).

Obstructive sleep apnea (OSA) is a condition characterized by repetitive upper airway obstruction during sleep. OSA may lead to a variety of symptoms including daytime sleepiness, impaired neurobehavioral performance, decreased quality of life, hypertension, and increased risk of cardiovascular disease. The diagnosis is made by an analysis of the respiratory events recorded by polysomnography (Figure 1). The apnea–hypopnea index (AHI), the frequency of apneas and hypopneas per hour, together with the severity of sleepiness are an indication of the severity of the OSA. These respiratory events must be accompanied by clinical symptoms for the diagnosis (Epstein et al. 2009). A score on the Epworth Sleepiness Scale (ESS; 0–24) indicates the degree of daytime sleepiness; a score above 10 is abnormal. By definition, OSA is classified as severe when patients fall asleep in situations that require great attention or when the AHI is above 30.

In our hospital, patients with vascular malformations are seen by a multidisciplinary team. After patient evaluation, radiological evaluation (MRI, angiography) and patient education, the treatment options are discussed. When patient history suggests OSA, patients are referred to the sleep specialist.

Here we present data on patient history and polysomnographic findings in a group of 13 patients with complaints of upper airway obstruction caused by a vascular malformation.

Methods:

This study was performed in compliance with institutional guidelines and tenets of the Declaration of Helsinki..

In the multidisciplinary team, a dermatologist, a plastic surgeon, a vascular surgeon, and an interventional radiologist evaluate the patients. After history taking and physical examination, additional radiological examination is performed. All patients undergo MRI, which shows the extent of the malformation and its flow characteristics. We included the patients referred to the sleep specialist from the period of January 1, 2000, to January 9, 2012.

Inclusion criteria were as follows: patients analysed by the multidisciplinary team for congenital vascular malformations; existence of oropharyngeal vascular malformation; complaints of upper airway obstruction and/or complaints seen in OSA; and referral to the sleep specialist. There were no exclusion criteria.

Patient age, gender, complaints, location and extent of the malformation, ESS score, and polysomnography are described. Descriptive statistics are used to present the data.

Results:

Thirteen patients were referred; their mean age was 49.0 years (range, 20–77 years); 7 were male and 6 female. Of the patients, 11 had a VM, one patient had an LM, and one had an AVM.

In two patients no ESS was noted, the other 11 patients had a mean ESS of 11.7 (range, 4–23).

After polysomnography, 11 of the 13 patients were diagnosed with OSA, whereby seven of them met the criteria for severe OSA; the mean apnea–hypopnea index (AHI) was 23 (0–69). The patient with an LM (of the tongue) had severe OSA, and the patient with an AVM had moderate OSA.

The complaints at referral and location of the malformation are noted in Table 1. The ESS, the results of the polysomnography, and the occurrence of OSA are noted in Table 2.

Discussion:

In the current literature, it is stated that upper airway obstruction can occur in oropharyngeal vascular malformations (Jacobs and Cahill 2011; Nouraei and Sandhu 2013). Obstruction in the paediatric airway by vascular anomalies is more often mentioned; this is caused mainly by hemangiomas in which the obstruction can worsen during the proliferative phase. As vascular malformations frequently occur in the head and neck area, it is remarkable that there is limited literature available on this subject.

In the Academic Medical Center of Amsterdam, 13 patients with complaints of upper airway obstruction were referred to a sleep specialist, to see if these patients had OSA.

In our patient group, the mean age was 49 years; so the complaints of upper airway obstruction had probably been present for years.

As vascular malformations grow commensurately with body growth, patients probably adapt to the complaints over time. This may be an explanation as to why patients rarely report these complaints and they are seldom mentioned in the literature concerning adult patients.

Therefore it is important to focus on complaints pointing to upper airway obstruction or OSA during history taking. The physical examination is of value, but the extent of the malformation is best objectified by MRI (Cure 2001). This will often show that the superficially seen malformation is only the ‘tip of the iceberg’ (Figure 2).

Eleven of the 13 patients were diagnosed with severe to mild OSA. These patients had a great variation in the involved anatomical structures, and the malformation differed from local (only the tongue) to extensive (from the neck to the temporal area). Nine of them had a venous malformation (VM). By expansion of the existing aberrant vessels, the VMs enlarge, which can happen under the influence of hormonal changes, thrombosis, or postural changes,

or be idiopathic. Patients may present with pain and swelling, often exacerbated by thrombosis, trauma, or venous stasis (Buckmiller et al. 2010). The lesions can be variably filled with blood and are compressible, which helps to distinguish them from lymphatic malformations. The degree of filling can slowly increase by hydrostatic pressure, which is seen in postural changes. In VMs of the head and neck, this effect is most distinct when patients go to bed. Dependent on the location and the extent of the malformation, this can lead to airway obstruction. Due to the gradual filling, the obstruction may not occur until the patient is asleep. As these changes occur over time, they are difficult to observe in the outpatient clinic. Sleeping in an upright position is an example of adjusting to problems provoked by the filling of the VM.

One patient (patient 8) had an arteriovenous malformation (AVM) of the left cheek, nose, and upper lip. This AVM also showed gradual filling in a supine position, which can explain the pattern of complaints similar to those in the patients with VMs.

One patient (patient 7) with a lymphatic malformation (LM) of the tongue was diagnosed with OSA. LMs are not influenced by postural changes, explaining the low incidence of patients with an LM in our series. The complaints of this patient show this, as they also occur during daytime.

In one other study, OSA was diagnosed in a patient with a venous malformation and large tonsils (Ramar et al. 2008).

A case series describes OSA in three patients with ‘mucosal hemangiomas of the oral cavity’; these patients are 45 to 70 years of age (Kimura et al. 1999). In one other case report, a 26-year-old man is diagnosed with a ‘hemangioma’ and OSA (Antoniadou et al. 2010). After the proliferative phase of hemangiomas in the first year of life, they start to regress in the subsequent years (Gampper and Morgan 2002; Mulliken and Glowacki 1982). Therefore it is

unlikely that these patients had a hemangioma. This stresses the importance of the use of the correct nomenclature.

In this article, we show that there is good reason for referral to a sleep specialist if patients with oropharyngeal vascular malformations have complaints of upper airway obstruction or symptoms of obstructive sleep apnea. In the 13 patients with these complaints, 11 (85%) met the criteria for OSA. More than half (7/13; 54%) had severe OSA. The multidisciplinary team, consisting of a vascular surgeon, a plastic surgeon, an intervention radiologist, and a dermatologist, first evaluated the malformation and subsequently started treatment. If no treatment options were left and complaints of upper airway obstruction coninued, patient were referred for additional treatment.

The diagnosis of OSA in these patients is of great value; it can be an explanation of multiple (longstanding) complaints such as snoring, apneas, hypersomnolence, daytime sleepiness, and mood disturbances. OSA is associated with other major health problems, for instance, increased cardiovascular disease risks (Epstein et al. 2009). As 85% of our referred patients are diagnosed with OSA, it is possible that the diagnosis is missed in other patients. Therefore we suggest that every patient with oropharyngeal vascular malformations and signs of airway obstruction (complaints; imaging) should be referred to a sleep specialist to exclude OSA.

Limitations of this study:

Due to the retrospective design of our study it was not possible to find the ESS in two patients.

For OSA there are several treatment options; the best-known treatment is with continuous positive airway pressure (CPAP) (Giles et al. 2006). There are also several surgical interventions and conservative measures, such as use of oral appliances.

With these study results, it will be interesting to see whether the known treatment options for OSA are also applicable in this patient group. We are working on a review of the treatments started in our patient group.

Conclusion:

Patients with oropharyngeal (head and neck) vascular malformations with complaints of upper airway obstruction or OSA should be referred to a sleep specialist for additional examination relating to the existence of OSA.

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Figure 1. A polysomnograph of one of the patients; the lower panel shows 1 apnea and 3 hypopneas followed by arousal.

Figure 2. (A) MRI T2-weighted image: Transversal view of patient 5; venous malformation of tongue base (upper arrow), submandibular, right lip; with compression of the oropharynx (lower arrow). (B) MRI T2-weighted image: Coronal view of patient 6; extensive venous malformation with compression of the oropharynx (upper arrow) and airway obliteration (lower arrow)

Table 1: Patients characteristics

Table 1		Sexe			
#	Age	M/F	Type	Complaints	Location
1	64	M	venous	Snore; salivate; sleeps upright	Tongue (base)
2	69	M	venous	Snore; hypersomnolence; salivate; sleeps upright	Tongue + oropharynx
3	42	F	venous	Snore; awakes dyspnoeic; hypersomnolence	Left pharynx + oropharynx, submandibular, submental, low in neck
4	38	F	venous	Snore; tiredness; restless sleep	Around oro -/hypopharynx → airway compression. malformation extends from low in the neck to temporal
5	64	M	venous	Headache; tired in the morning	Left lower lip + tongue base+ floor of the mouth + submandibular
6	61	M	venous	Falling asleep during daytime; apnoeas; choking	Extensive malformation right side; parotid; parapharyngeal; retropharyngeal; oro- /hypopharynx; paratracheal Left side: m. masseter; hypopharynx
7	40	M	lymphatic	Snore; apnoeas (also by day); choking	Tongue
8	77	F	AVM	Snore; early awake, short naps	Extensive malformation left side: maxillary sinus; hard palate; infraorbital; intracranial
9	25	M	venous	Snore; apnoeas	Right side: subcutaneous fat; parapharyngeal; oropharynx; soft palate; parotid; orbital
10	58	F	venous	Progressive snoring	Right side: fossa infratemporalis; tongue; floor of the mouth; epiglottis (narrowed hypofarynx)
11	50	M	venous	Snoring; tightness in the throat with exercise; tired	Tongue; some laryngeal areas: supraglottic+hypopharynx left-side lower lip
12	20	F	venous	Tired; hypersomnolence; sleeps upright	Right: pretracheal cysteus lesion close to the thyroid
13	29	F	venous	Snore; mouth open; choke; sleeps a bit upright	M. pterygoideus medialis to presternal; left lateral side of tongue

Age in years; Sexe M/F: Sexe Male/Female; location: location of malformation on MRI; AVM: arterio-venous malformation

Table 2: Outcome Sleep Specialist

Table 2					PSG	PSG	
#	Age (y)	Sexe M/F	Type	ESS [0-24]	AHI	Mean sat %	OSA
1	64	M	venous	11	60	94	Severe
2	69	M	venous	12	50	95.4	Severe
3	42	F	venous	23	8	96	Severe
4	38	F	venous	13	45	95.4	Severe
5	64	M	venous	8	50	93	Severe
6	61	M	venous	15	63	91.3	Severe
7	40	M	lymphatic	XX	69	97	Severe
8	77	F	AVM	16	22	93	Moderate
9	25	M	venous	8	22	96	Moderate
10	58	F	venous	10	13	95	Mild
11	50	M	venous	4	10	93	Mild
12	20	F	venous	9	1	97	No
13	29	F	venous	XX	0	97	No

ESS: Epworth Sleepiness Scale; PSG: Polysomnography; AHI: Apnoea/Hypopnoea Index; Mean sat %: Mean venous blood saturation %; OSA: severity of obstructive sleep apnoea